

WHAT IS CLAIMED IS:

1. A position identifier management apparatus for supporting the movement of a mobile computer between networks, comprising:

storage means for storing binding information concerning said mobile computer managed by said position identifier management apparatus, said binding information including a compatible node identifier for uniquely specifying said mobile computer and a compatible position identifier for uniquely specifying a position of said mobile computer on a network;

registration means for registering the binding information in said storage means in response to a registration request to register the binding information from another apparatus; and

transmitting means for transmitting the binding information in response to a query about the binding information concerning said mobile computer from another apparatus when said binding information is stored in said storage means.

2. A position identifier management apparatus according to claim 1, further comprising:

means for registering binding information contained in

the received registration request after detecting that a sender of the received registration request is an external mobile computer and authenticating said external mobile computer as a valid mobile computer;

means for sending said registration request to an external position identifier management apparatus which also manages said external mobile computer when said external mobile computer is authenticated as a valid mobile computer; and

means for registering the binding information contained in the received registration request in said storage means after detecting that the sender of the received registration request is an external position identifier management apparatus and authenticating said external position identifier management apparatus as a valid apparatus.

3. A position identifier management apparatus according to claim 1, wherein said transmitting means transmits the binding information containing the compatible node identifier which is identical to the compatible node identifier contained in the query.

4. A position identifier management apparatus according to claim 1, wherein the binding information includes a registered time and an effective period, and said

position identifier management apparatus further comprises means for erasing the binding information which has expired.

5. A position identifier management apparatus according to claim 1, wherein the compatible node identifier of said mobile computer comprises a first virtual network identifier assigned to said mobile computer which moves between networks and a node identifier for uniquely specifying said mobile computer, and the compatible position identifier of said mobile computer comprises a second network identifier which is usable only by mobile computers assigned to a network to which said mobile computer is connected and the node identifier.

6. A mobile computer which moves between networks, comprising:

first storage means for storing binding information including a compatible node identifier and a compatible position identifier, the compatible node identifier including a first virtual network identifier assigned to said mobile computer which moves between networks and a node for uniquely specifying said mobile computer, the compatible position identifier including a second network identifier which is usable only by mobile computers assigned to a network to which said mobile computer is connected and the

node identifier;

second storage means for storing binding information concerning at least one of external mobile computers with which said mobile computer is to communicate, said binding information including a compatible node identifier and a compatible position identifier, the compatible node identifier including a first virtual network identifier assigned to said external mobile computer which moves between networks and a node identifier of said external mobile computer, the compatible position identifier including a second network identifier which is usable only by mobile computers assigned to a network to which said external mobile computer is connected and the node identifier of said external mobile computer;

determining means for determining whether the binding information is to be used for a packet transmitting or receiving operation; and

conversion means for performing, when said determining means determines that the binding information is to be used, a conversion operation by converting the compatible node identifier to the compatible position identifier when the packet is to be transmitted and by converting from the compatible position identifier to the compatible node identifier when the packet is to be received.

7. A mobile computer according to claim 6, wherein said determining means determines that the conversion operation is to be performed by said conversion means when a destination address of the packet to be transmitted is designated with said compatible node identifier.

8. A mobile computer according to claim 7, wherein, when said determining means determines that the conversion operation is to be performed by said conversion means in order to transmit the packet, said conversion means acquires the compatible position identifier corresponding to the compatible node identifier which designates the destination address of the packet to be transmitted, and then converts the destination address of the packet into the acquired compatible position identifier, and sets the compatible position identifier of said mobile computer stored in said first storage means as a source address of the packet.

9. A mobile computer according to claim 6, wherein said determining means determines that the conversion operation is to be performed by said conversion means when a source address and a destination address of the packet to be received are designated with the compatible position identifiers.

10. A mobile computer according to claim 9, wherein, when said determining means determines that the conversion operation is to be performed by said conversion means in order to receive the packet, said conversion means converts the compatible position identifier into the compatible node identifier by at least substituting the second network identifier contained in the compatible position identifier which designates the source address of the packet by the first virtual network identifier, and also verifies the integrity of the compatible node identifier which designates the source address of the packet.

11. A mobile computer according to claim 6, wherein, when said determination means determines that the conversion operation by said conversion means is not performed, it is assumed that each of a source address and a destination address of the packet is a position identifier for uniquely specifying the position of said mobile computer on a network and containing a third network identifier which does not support the movement of said mobile computer, and the packet is transmitted or received by using said source address and said destination address.

12. A mobile computer according to claim 6, further comprising:

movement detection means for detecting the movement of said mobile computer by a change in a third network identifier which does not support the movement detected on a network to which said mobile computer is connected;

acquiring means for acquiring the second network identifier when the movement of said mobile computer is detected;

generating means for generating new binding information based on the acquired second network identifier; and

updating means for updating the binding information concerning said mobile computer stored in said first storage means by the new binding information generated by said generating means.

13. A mobile computer according to claim 12, further comprising:

first specifying means for specifying a position identifier management apparatus which manages said mobile computer from position identifier management apparatuses, disposed on a network, for storing the binding information which is requested to be registered by mobile computers managed by said position identifier management apparatuses and for responding to a query about the binding information; and

registration request sending means for sending the new

binding information concerning said mobile computer generated by said generating means to the position identifier management apparatus specified by said first specifying means.

14. A mobile computer according to claim 6, further comprising:

second specifying means for specifying a position identifier management apparatus which manages an external mobile computer with which said mobile computer is to communicate, from position identifier management apparatuses, disposed on a network, for storing the binding information which is requested to be registered by mobile computers managed by said position identifier management apparatuses, and for responding to a query about the binding information;

query sending means for sending, when said second storage means does not store effective binding information about said external mobile computer, a query about the binding information concerning said external mobile computer containing the compatible node identifier to the position identifier management apparatus specified by said second specifying means;

response receiving means for receiving a response to the query from the position identifier management apparatus specified said second specifying means; and



registration means for registering the binding information concerning said external mobile computer contained in the received response in said second storage means.

15. A mobile computer according to claim 6, wherein the binding information includes a registered time and an effective period, and said mobile computer further comprises means for erasing the binding information which has expired.

16. A position identifier management method comprising:

storing by a mobile computer latest binding information including a compatible node identifier and a compatible position identifier in storage means of said mobile computer when the movement of said mobile computer is detected, the compatible node identifier containing a first virtual network identifier assigned to said mobile computer which moves between networks and a node identifier for uniquely specifying said mobile network, the compatible position identifier containing a second network identifier which is usable only by mobile computers assigned to a network to which said mobile computer is moved and the node identifier;

specifying by said mobile computer at least one position identifier management apparatus which manages said

mobile computer from position identifier management apparatuses, disposed on a network, for storing the binding information which is requested to be registered from an external mobile computer managed by said position identifier management apparatuses, and for responding to a query about the binding information;

sending a registration request to register the latest binding information about said mobile computer from said mobile computer to one of the specified position identifier management apparatuses;

storing the binding information contained in the registration request in said storage means of the position identifier management apparatus which has received the registration request after the position identifier management apparatus detects that the sender of the registration request is said mobile computer and authenticates said mobile computer as a valid mobile computer; and

sending the registration request to an external position identifier management apparatus which also manages said mobile computer after said mobile computer which has sent the registration request is authenticated as a valid mobile computer.

17. A position identifier management method according

to claim 16, wherein said mobile computer sends a query containing the position node identifier of said mobile computer to a server for storing a relationship between the compatible node identifier and an address of a position identifier management apparatus which manages said mobile computer provided with the compatible node identifier, and receives a response to the query from said server, thereby specifying the position identifier management apparatus which manages said mobile computer.

18. A position identifier processing method for a mobile computer, comprising the steps of:

storing binding information including a compatible node identifier and a compatible position identifier in storage means of said mobile computer, the compatible node identifier containing a first virtual network identifier assigned to said mobile computer which moves between networks and a node identifier for uniquely specifying said mobile computer, the compatible position identifier containing a second network identifier which is usable only by mobile computers assigned to a network to which said mobile computer is connected and the node identifier;

acquiring, when a destination address of a packet to be transmitted is designated with the compatible node identifier and when said storage means does not store the

compatible node identifier, the binding information containing the compatible node identifier by making a query to a position identifier management apparatus which manages the binding information concerning a mobile computer provided with the compatible node identifier; and

converting the compatible node identifier representing the destination address of the packet to be transmitted into the acquired compatible position identifier, and setting the compatible position identifier of said mobile computer stored in said storage means as the source address of the packet.

19. A position identifier processing method according to claim 18, wherein, when an error message indicating that the packet has not reached is returned after sending the packet having the compatible position identifiers as the source address and the destination address, a query is made to the position identifier management apparatus which manages the binding information concerning the mobile node provided with the compatible node identifier corresponding to the compatible position identifier so as to acquire the latest binding information concerning the mobile computer provided with the compatible node identifier, and then, the packet is re-transmitted.

20. A position identifier processing method for a mobile computer, comprising the steps of:

storing binding information including a compatible node identifier and a compatible position identifier in storage means of said mobile computer, the compatible node identifier containing a first virtual network identifier assigned to said mobile computer which moves between networks and a node identifier for uniquely specifying said mobile computer, the compatible position identifier containing a second network identifier which is usable only by mobile computers assigned to a network to which said mobile computer is connected and the node identifier; and

converting, when each of a source address and a destination address of a received packet is designated with the compatible position identifier, the compatible position identifier into the compatible node identifier by at least substituting the second network identifier of the compatible position identifier which designates the source address of the packet by the first network identifier, and also verifying the integrity of the compatible node identifier which designates the source address of the packet.

21. A position identifier management apparatus for supporting the movement of a mobile computer between networks, comprising:

storage unit configured to store binding information

concerning said mobile computer managed by said position identifier management apparatus, said binding information including a compatible node identifier for uniquely specifying said mobile computer and a compatible position identifier for uniquely specifying a position of said mobile computer on a network;

registration unit configured to register the binding information in said storage unit in response to a registration request to register the binding information from another apparatus; and

transmitting unit configured to transmit the binding information in response to a query about the binding information concerning said mobile computer from another apparatus when said binding information is stored in said storage unit.

22. A mobile computer which moves between networks, comprising:

first storage unit configured to store binding information including a compatible node identifier and a compatible position identifier, the compatible node identifier including a first virtual network identifier assigned to said mobile computer which moves between networks and a node for uniquely specifying said mobile computer, the compatible position identifier including a second network identifier which is usable only by mobile

computers assigned to a network to which said mobile computer is connected and the node identifier;

second storage unit configured to store binding information concerning at least one of external mobile computers with which said mobile computer is to communicate, said binding information including a compatible node identifier and a compatible position identifier, the compatible node identifier including a first virtual network identifier assigned to said external mobile computer which moves between networks and a node identifier of said external mobile computer, the compatible position identifier including a second network identifier which is usable only by mobile computers assigned to a network to which said external mobile computer is connected and the node identifier of said external mobile computer;

determining unit configured to determine whether the binding information is to be used for a packet transmitting or receiving operation; and

conversion unit configured to perform, when said determining unit determines that the binding information is to be used, a conversion operation by converting the compatible node identifier to the compatible position identifier when the packet is to be transmitted and by converting from the compatible position identifier to the compatible node identifier when the packet is to be received.